

Commonwealth Edison Company
1401 Opus Place
Downers Grove, IL 60515-5700

People's Cross #6
10 CFR 50.82(a)(4)(i)

ComEd

OFFICIAL FILE

U.S.C. DOCKET NO. 00-0341
People's Cross Exhibit No. 6
Witness _____
Date 8/24/00 Reporter (B)

February 14, 2000

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Zion Nuclear Power Station, Units 1 and 2
Facility Operating License Nos. DPR-39 and DPR-48
NRC Docket Nos. 50-295 and 50-304

Subject: Submittal of the Zion Nuclear Power Station, Units 1 and 2 Post-Shutdown Decommissioning Activities Report

Reference: Commonwealth Edison Company letter, "Certification of Permanent Cessation of Operations," dated February 13, 1998

In accordance with 10 CFR 50.82, "Termination of license," paragraph (a)(4)(i), we are submitting the post-shutdown decommissioning activities report (PSDAR) for Zion Nuclear Power Station (ZNPS), Units 1 and 2. As certified by the Reference letter, the permanent cessation of operations at ZNPS occurred on February 13, 1998. 10 CFR 50.82(a)(4)(i) requires that a PSDAR be submitted prior to or within two years following the permanent cessation of operations. Therefore, the PSDAR for ZNPS is required to be submitted by February 14, 2000.

In accordance with 10 CFR 50.82(a)(4)(i), the Attachment, "Zion Nuclear Power Station Units 1 and 2 Post-Shutdown Decommissioning Activities Report," includes a description of the planned decommissioning activities along with a schedule for their accomplishment, an estimate of expected costs; and a discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate, previously issued, environmental impact statements.

February 14, 2000
U.S. Nuclear Regulatory Commission
Page 2

In accordance with 10 CFR 50.82(a)(4)(i), a copy of the PSDAR for ZNPS is being provided to the affected State by transmitting a copy of this letter and its attachment to the designated State Official.

If you have any questions about this letter, please contact Mr P R Simpson at (630) 663-7971.

Respectfully,

A handwritten signature in cursive script, appearing to read "K. A. Ringer for".

R. M. Krich
Vice President - Regulatory Services

Attachment

cc. Regional Administrator - NRC Region III
Office of Nuclear Facility Safety - Illinois Department of Nuclear Safety

Zion Nuclear Power Station

Units 1 and 2

Post-Shutdown Decommissioning

Activities Report

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
I. INTRODUCTION.....	1
II. BACKGROUND.....	2
III. DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES.....	4
IV. SCHEDULE OF PLANNED DECOMMISSIONING ACTIVITIES.....	12
V. ESTIMATE OF EXPECTED DECOMMISSIONING COSTS.....	16
VI. ENVIRONMENTAL IMPACTS.....	18
VII. REFERENCES.....	22

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

I. INTRODUCTION

In accordance with the requirements of 10 CFR 50.82, "Termination of license," paragraph (a)(4)(i), this report provides the Commonwealth Edison (ComEd) Company post-shutdown decommissioning activities report (PSDAR) for Zion Nuclear Power Station (ZNPS), Units 1 and 2

This report is arranged into four sections that supply the information required in a PSDAR as described in 10 CFR 50.82. These sections include:

- A description of the planned decommissioning activities along with a schedule for their accomplishment,
- An estimate of expected costs, and
- A discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate previously issued environmental impact statements.

Section II, "Background," provides a brief discussion of the design and history of ZNPS. The planned decommissioning activities and the general sequencing of their implementation are described in Section III, "Description of Planned Decommissioning Activities." The overall decommissioning schedule is found in Section IV, "Schedule of Planned Decommissioning Activities." A site specific cost estimate is given in Section V, "Estimate of Expected Decommissioning Costs." Section VI, "Environmental Impacts," contains the reasons for concluding the ZNPS decommissioning related activities will be bounded by previously issued environmental impact statements

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

II. BACKGROUND

The ZNPS is located in northeast Illinois on the west shore of Lake Michigan. The site is approximately 40 miles north of Chicago, Illinois, and 42 miles south of Milwaukee, Wisconsin.

ZNPS is comprised of two essentially identical pressurized water reactors with supporting facilities. The primary coolant system for each unit employed a four-loop pressurized water reactor nuclear steam supply system designed by Westinghouse Electric Corporation housed in a steel-lined and reinforced concrete containment structure. Each unit was designed for a thermal power output of 3250 megawatts. The corresponding gross electrical output of the turbine generator system for each unit was 1085 megawatts.

A brief history of major plant operations and licensing-related actions for ZNPS is as follows.

- Construction Permit issued, December 1968,
- Operating license issued April 6, 1973, for Unit 1 and November 14, 1973, for Unit 2,
- Commercial operations achieved, December 1973 for Unit 1 and September 1974 for Unit 2,
- Final reactor operation, February 21, 1997, for Unit 1 and September 19, 1996, for Unit 2, and
- All fuel removed from the reactor and placed in the spent fuel pool, April 27, 1997, for Unit 1 and February 25, 1998, for Unit 2.

On January 14, 1998, the Unicom Corporation and ComEd Boards of Directors authorized the permanent cessation of operations at ZNPS for economic reasons. The cost and time it would take to repair the steam generators combined with the cost of electricity in a deregulated environment in Illinois made continuing operation of ZNPS uneconomical.

In accordance with 10 CFR 50.82(a)(1)(i), ComEd certified in the Reference 1 letter that as of February 13, 1998, operations ceased at ZNPS, in terms of the requirements of 10 CFR 50.4(b)(8), "Written communications." In accordance with 10 CFR 50.82(a)(1)(ii), ComEd certified in the Reference 2 letter that all fuel had been removed from the ZNPS reactor vessels and committed to maintain them permanently defueled. The NRC acknowledged the certification of permanent cessation of power operation and permanent removal of fuel from the reactor vessels in the Reference 3 letter.

Zion Nuclear Power Station Post-Shutdown Decommissioning Activities Report

Pursuant to 10 CFR 50.82(a)(2), upon docketing of the certifications in the Reference 1 and 2 letters, the 10 CFR 50 facility operating licenses for ZNPS no longer authorize operation of the reactors or emplacement or retention of fuel in the reactor vessels. Also, pursuant to 10 CFR 50.51(b), "Continuation of license," the facility operating licenses scheduled to expire on April 6, 2013, for Unit 1, and November 14, 2013, for Unit 2, continue to remain in effect until the NRC notifies ComEd that the licenses have been terminated

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

III. DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES

The primary goal is to decommission ZNPS in a safe and cost effective manner. The SAFSTOR decommissioning approach has been chosen, also referred to as Delayed-DECON, which decommissions the site in a timely manner, but recognizes constraints associated with storage of the spent fuel and decommissioning funding availability for ZNPS. In this Delayed-DECON approach, decontamination and dismantlement activities are interspersed with periods of time in which ZNPS will be in a SAFSTOR condition.

Decommissioning field activities are scheduled to begin on the same schedule as if ZNPS operated to the end of its licensed lifetime. This permits the decommissioning trusts to be fully funded prior to field activities. In addition, the SAFSTOR approach recognizes the constraint imposed by the spent fuel residing onsite and the need to retain the ability to prepare and package the spent fuel for transportation offsite during the decommissioning process.

Spent fuel shipments from ZNPS to the Department of Energy (DOE) could be scheduled as soon as practicable following the geologic repository commencing operations, which is currently scheduled for 2010. The site will be decommissioned around the fuel handling building which contains the spent fuel pool. The spent fuel will remain in wet storage until the last of it is transferred to the DOE in 2025. Delays in the operation of the geologic repository will limit the transfer of spent fuel and increase the length of time until the licenses for ZNPS can be terminated.

Based on the above overall plan, the decommissioning of ZNPS has been divided into five periods.

- SAFSTOR Preparations,
- SAFSTOR Dormancy,
- Preparations for Decontamination and Dismantlement,
- Decommissioning Operations, and
- Site Restoration.

The following provides a discussion of the current decommissioning plan, the significant activities, and the general sequencing for each of the above periods. The planning required for each decommissioning activity, including the selection of the process to perform the work, will be completed prior to the start of work for that activity. Finally, a discussion of other issues related to decommissioning is included.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

SAFSTOR Preparations

SAFSTOR preparations is the period of time when detailed preparations and activities are undertaken following plant shutdown to provide a smooth transition from plant operations to SAFSTOR dormancy. The time period between the decision to permanently shutdown and decommission ZNPS and the submittal of this PSDAR to the NRC has been utilized to establish a decommissioning organization; create a Spent Fuel Nuclear Island (SFNI) out of the fuel handling building; prepare the Defueled Safety Analysis Report, the Defueled Station Emergency Plan, the Defueled Physical Security Plan, and the Permanently Defueled Technical Specifications; and place ZNPS into SAFSTOR dormancy.

Work activities during this period include, but are not limited to, the following.

- Develop a decommissioning organizational structure and select staff.
- Review and reclassify systems, structures, and components consistent with the defueled and permanently shutdown configuration.
- Review and revise plant programs and procedures, as necessary, to be consistent with the defueled and permanently shutdown configuration
- Design and implement spent fuel storage and fuel handling systems which are capable of functioning independently from other existing plant systems, structures, and components to support wet spent fuel storage in the fuel handling building (i.e., the SFNI).
- Drain/de-energize/secure/isolate systems not required to support decommissioning operations.
- Defuel the reactor vessels and reassemble them with internals in place
- Perform radiation surveys of the plant and post warning signs as appropriate.
- Erect physical barriers and/or secure all access to radioactive or contaminated areas, except as required for controlled access (i.e., inspection and maintenance).

SAFSTOR Dormancy

SAFSTOR dormancy is the extended time period of safe storage of the facility. During this period, spent fuel will be stored in the spent fuel pool inside of the SFNI. Sufficient personnel will be retained to maintain required systems and

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

provide radiological surveillance to ensure that radioactivity is not spread from the plant to the site or the environment.

Equipment corrective and preventive maintenance, inspection activities, and routine operations will be performed. Systems/structures needed to support the SFNI, security, fire protection, and environmental and radiological monitoring will be maintained in a safe condition and in accordance with Technical Specifications requirements. Abandoned systems will be monitored and maintained, as needed, to control radioactive material. Systems and equipment no longer needed may be removed from the site for asset recovery. In addition, the structural integrity of buildings will be monitored and maintained.

Areas that do not require routine access will be locked and secured. Areas containing radioactive materials or other contamination will be secured to prevent accidental intrusion, and make deliberate intrusion very difficult. Shielding will be added, where necessary, to maintain radiation exposure to plant personnel as low as is reasonably achievable (ALARA). Routine periodic radiological inspections of contaminated buildings will be conducted. Decontamination activities will be generally limited to those necessary to maintain exposures ALARA.

Radiological and environmental surveillance programs will be carried out during the SAFSTOR dormancy period to ensure that potential releases of radioactive material to the environment are detected and controlled. The surveillance programs will be conducted in accordance with the facility Technical Specifications, operating licenses, DSAR, and Offsite Dose Calculation Manual.

Preparations for Decontamination and Dismantlement

Preparations for decontamination and dismantlement is the time period in anticipation of decommissioning activities when detailed preparations are undertaken to provide a smooth transition from SAFSTOR dormancy to dismantlement. The organization required is assembled from available plant staff and outside resources, as required

In preparation for actual decommissioning activities, the following activities are initiated.

- Prepare site support and storage facilities, as required
- Begin site characterization so that radiological, regulated, and hazardous wastes will be identified, categorized, and quantified as decommissioning progresses.
- Conduct radiation surveys of work areas, major components, and sampling of internal piping contamination levels.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

- Prepare work plans for decontamination and dismantling activities.
- Determine transportation and disposal container requirements for activated materials and/or hazardous materials, including shielding and stabilization.
- Develop activity specifications and task specific procedures for occupational exposure control, control and release of liquid and gaseous effluents, processing of radwaste generated in decommissioning, site security, and industrial safety.

Decommissioning Operations

The actual decontamination and dismantlement of ZNPS will occur during the period of decommissioning operations. However, until the spent fuel and any greater-than-class C (GTCC) waste is transferred to the DOE, SAFSTOR dormancy will continue for the SFNI.

Activities to be performed during this period include, but are not limited to, the following

- Conduct decontamination of components and piping systems, as required, to control (i.e., minimize) worker exposure. Remove, package, and dispose of all piping and components that are no longer essential to support decommissioning operations.
- Remove control rod drive housings and the head service structure from the reactor vessel head and package for controlled disposal.
- Segment reactor vessel closure head and vessel flange for shipment.
- Disassemble/segment remotely underwater the reactor internals and package in shielded casks.
- Segment/section the reactor vessel: placing segments into shielded containers. These operations are performed remotely in air using a contamination control envelope
- Package GTCC components into containers for handling and storage in the SFNI.
- Remove the reactor coolant piping and pumps.
- Remove systems and associated components as they become non-essential to the vessel removal operations, related decommissioning

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

activities, or worker health and safety (e.g., waste collection and processing systems, electrical and ventilation systems, etc.).

- Remove activated concrete biological shield and accessible contaminated concrete.
- Modify the containment structure to permit removal of large components.
- Remove steam generators and pressurizer for shipment and controlled disposal.
- Remove steel liners from the refueling canal and containment.
- Remove contaminated equipment and material from the auxiliary building.
- Decontaminate remaining site buildings and facilities with residual contaminants around the SFNI. Package and dispose of all remaining low-level radioactive waste along with any remaining hazardous materials.
- Remove remaining components, equipment, and plant services in support of the area release survey(s).

Once the plant has been dismantled around the SFNI, the SFNI remains to support the spent fuel and GTCC waste in wet storage until it is transferred to the DOE. The activities during this second SAFSTOR dormancy period are similar to those described for the initial SAFSTOR dormancy period. Transfer of the spent fuel and GTCC waste to the DOE will occur during this period. Once all spent fuel and GTCC waste is transferred to the DOE, the systems that support wet fuel storage will be removed and the SFNI decontaminated.

During this period, at least two years prior to the anticipated date of license termination, the license termination plan (LTP) will be prepared in accordance with 10 CFR 50.82(a)(9). The LTP will define the details of the final radiological survey to be performed once all decontamination activities are completed. The LTP will conform to the format defined in Regulatory Guide 1.179 (i.e., Reference 4) and will address the limits of 10 CFR 20, Subpart E, "Radiological Criteria for License Termination," using the pathways analysis defined in NUREG-1575 (i.e., Reference 5). Use of this guidance ensures that survey design and implementation are conducted in a manner that provides a high degree of confidence that applicable regulatory criteria are satisfied. Once the NRC has approved the license termination plan, the final remediation of site facilities may commence.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

The final site survey, deferred until after removal of the spent fuel and GTCC waste, can now be performed to demonstrate that the site can be released for unrestricted use. Once the final site survey is complete, an application to terminate the licenses for ZNPS will be submitted to the NRC for approval.

Site Restoration

Site restoration is the period beginning after the licenses for ZNPS have been terminated and when the demolition of non-radioactive structures and back-filling of any excavations remaining after decommissioning operations will occur. Restored areas on the site will be back-filled, graded, and landscaped as needed. Some structures onsite may remain to be available for alternative use. The electrical switchyard will remain after decommissioning in support of the existing offsite electrical transmission and distribution system.

Other Decommissioning Issues

The decontamination and/or dismantlement of contaminated systems, structures, and components may be accomplished by decontamination in place, decontamination and dismantlement, or dismantlement and disposal. A combination of these methods may be utilized to reduce contamination levels, worker radiation exposures, and project costs. These methods are the most practicable and widely used in the industry.

General Decommissioning Activities Relating to Removal of Radiological Components and Structures

Components will be safely and efficiently removed using the techniques and methods determined to be the most appropriate for the particular circumstances. Material removed in the decontamination and dismantling will be routed to an onsite central processing area. Material below the applicable radiological limits will be released for unrestricted disposition (e.g., scrap, recycle, or general disposal). Radioactively contaminated or activated materials will be removed from the site as necessary to allow the site to be released for unrestricted use.

Low-level radioactive waste will be processed in accordance with plant procedures and existing commercial options. Contaminated material will be characterized and segregated for additional onsite decontamination or processing, offsite processing (e.g., disassembly, chemical cleaning, volume reduction, waste treatment, etc.), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Contaminated concrete and structural steel components will be decontaminated and removed as required to gain access to contaminated and uncontaminated systems and components. After the systems and components are removed and processed as described above, the remaining contaminated concrete and

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

structural steel components will be decontaminated and/or removed. Contaminated concrete will be packaged and shipped to a low-level waste disposal facility. Contaminated structural steel components may be removed to a processing area for decontamination, volume reduction, and packaging for shipment to a processing facility or to a low-level radioactive waste disposal facility, as required.

Buried contaminated components (e.g., piping, drains, etc.) will be decontaminated in place or excavated. After excavation, the components will be examined to ensure that they are physically sound prior to cutting and removal. Appropriate contamination controls will be employed to minimize the spread of contamination and protect personnel

Low-Level Radioactive Waste Disposal

The low-level radioactive waste generated in the decontamination and dismantling of ZNPS is destined for the Central Midwest Compact's future disposal site. Illinois has been designated as the host state for the disposal facility. The process of selecting and developing a suitable site is in the early stages, with work progressing on siting and selection criteria. The opening of a low-level radioactive waste disposal facility in Illinois is not anticipated until sometime around the year 2012. Some low-level radioactive waste (e.g., concrete scabble dust and contaminated soils) may meet the disposal criteria for the Envirocare facility located in Clive, Utah and be shipped there.

After ZNPS shutdown, very low levels of radioactive contamination have been identified in secondary side systems. The secondary side of the steam generators, main steam system, condensate system, and feedwater system, along with connecting systems and equipment, may contain some radioactive contamination. Material removed from the secondary side of the plant will be surveyed, decontaminated when appropriate, and buried as low-level radioactive waste as necessary.

Removal of Mixed Wastes

Hazardous radioactive (i.e., mixed) wastes are not expected to be generated during decommissioning. Existing mixed wastes, if any, will be managed according to all applicable Federal and State regulations.

Mixed wastes from ZNPS will be transported only by authorized and licensed transporters and shipped only to authorized and licensed facilities. If technology, resources, and approved processes are available, processes will be evaluated to render the mixed waste non-hazardous.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report**Storage of Spent Fuel and GTCC Waste**

The Nuclear Waste Policy Act of 1982, assigned the responsibility for disposal of spent nuclear fuel and high-level radioactive waste created by the commercial nuclear generating plants to the DOE. This legislation also created a Nuclear Waste Fund to cover the cost of the program, which has been funded, in part, by the sale of electricity from ZNPS, and an estimated equivalent for fuel assemblies irradiated prior to April, 1983.

After several delays, the DOE indicates that they will not begin acceptance of spent fuel before 2010. For planning purposes, it has been assumed that the geologic repository will not be operational until at least 2010 with the first shipment of spent fuel from ZNPS occurring in 2022. Therefore, the spent fuel and any GTCC waste are currently planned to be stored wet in the spent fuel pool for the duration of the decommissioning until the DOE is ready to take such waste. Shipments of spent fuel and GTCC waste to the DOE are planned to be done directly from the SFNI

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report**IV. SCHEDULE OF PLANNED DECOMMISSIONING ACTIVITIES**

The SAFSTOR approach is the intended decommissioning method to be utilized for ZNPS which involves removal of all radioactive material from the site following a period of dormancy. Preparations for decontamination and dismantlement are scheduled to commence at the original license expiration date for ZNPS Unit 2 on November 14, 2013.

This schedule recognizes that spent fuel and GTCC waste will be retained in wet storage in the SFNI until such waste is transferred to the DOE. As discussed in Section III, "Description of Planned Decommissioning Activities," for planning purposes, the transfer to DOE is initiated in 2022 and completed in 2025. Also, the activities during the decommissioning operations period will be split into two decontamination and dismantlement periods: a selected decontamination and dismantlement period followed by a SFNI dormancy period and then a final decontamination and dismantlement period. Decontamination and dismantlement of the SFNI and associated systems will take place once the spent fuel and GTCC waste is transferred to the DOE.

Major milestones established for decommissioning ZNPS are listed in the table below.

PERIOD	DATES
SAFSTOR Preparations	1998 - 2000
SAFSTOR Dormancy	
Unit 1	2000 - 2013
Unit 2	2000 - 2015
Preparations for Decontamination and Dismantlement	
Unit 1	2013 - 2015
Unit 2	2015 - 2016
Decommissioning Operations	
Unit 1	2015 - 2017
Unit 2	2016 - 2019
SFNI Dormancy	2019 - 2025
SFNI Decommissioning	2025 - 2026
Final Site Survey/License Termination	2025 - 2026
Site Restoration	2026 - 2028

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

Figure IV-1, "ZNPS Decommissioning Schedule," presents the schedule and milestones in a project timeline for each unit of ZNPS, as necessary. Common facilities are included with the schedule for ZNPS Unit 2. The schedule begins with the initial decision to permanently cease plant operations.

Completion of the decommissioning schedule is contingent upon three key factors.

- Access to licensed low-level radioactive waste disposal sites.
- Removal of spent fuel and GTCC waste from the site, and
- Timely funding of the decommissioning activities.

Under any eventuality such as unavailability of a low-level radioactive waste disposal site, temporary shortfall in decommissioning funding, or other unforeseen circumstances, the capability to suspend decontamination and dismantlement activities and maintain ZNPS in a safe storage condition with appropriate funding will be maintained.

FIGURE IV-1

Post Shutdown Decommissioning Activities Report

ZNPS DECOMMISSIONING SCHEDULE

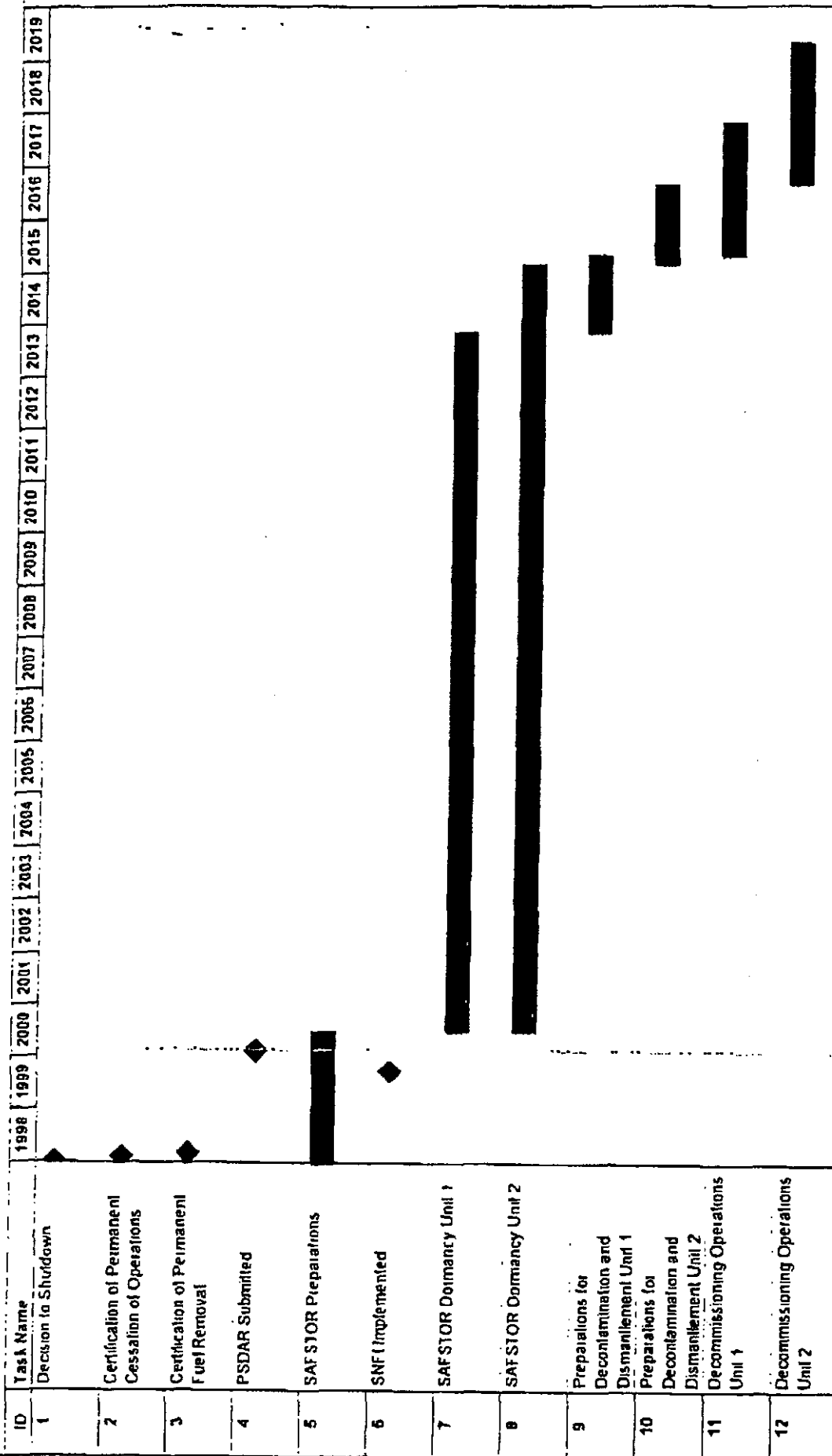
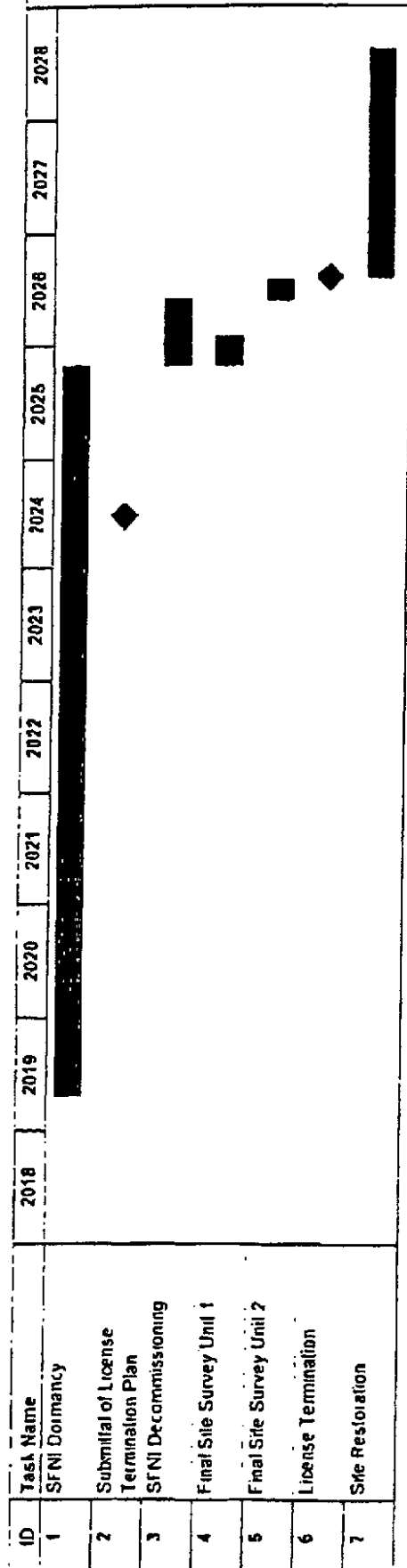


FIGURE IV-1 (Continued)

Post-Shutdown Decommissioning Activities Report

ZNPS DECOMMISSIONING SCHEDULE



Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report**V. ESTIMATE OF EXPECTED DECOMMISSIONING COSTS**

In February 1999, TLG Services, Inc. completed a ZNPS site-specific decommissioning cost estimate which was submitted by the Reference 6 letter. The estimate included consideration of regulatory requirements, contingency requirements, and low and high-level radioactive waste disposal availability. The methodology utilized to develop the cost estimates followed the basic approach originally presented in "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," (i.e., Reference 7). The methodology involved a unit cost factor approach for estimating the decommissioning activity costs. It also included use of site specific information when available (e.g., hourly labor rates) and the latest available industry experience (e.g., information from the Shippingport Station Decommissioning Project and TLG Services experience in planning and engineering for the Shoreham Plant, Yankee Rowe Plant, Trojan Plant, Rancho Seco Plant, and other facilities).

Table V-1, "Zion Nuclear Power Station Summary of Decommissioning Costs," provides a cost estimate summary from the February 1999 study. Common systems and structures are assigned to, and incorporated within, the estimate for Unit 2 as being required to support decommissioning operations.

The total estimated cost to complete decommissioning of ZNPS is approximately \$904 million in 1996 dollars. This includes provisions for storage of spent fuel and GTCC wastes on the ZNPS site until 2025. This cost estimate does not include any site restoration costs. If the DOE were to delay its obligations to accept spent fuel after 2010, decommissioning costs would increase.

Funding for decommissioning ZNPS is provided by an external trust. Because of the premature shutdown of ZNPS, funds for the decommissioning of ZNPS will continue to be collected throughout the remainder of the original operating license period (i.e., the year 2013). The funding assurance mechanism being used as the source of revenues for the external sinking funds is traditional "cost-of-service" ratemaking.

The ZNPS decommissioning cost estimate will be updated and funding adjusted as necessary in accordance with 10 CFR 50.82(a)(8)(iv) over the duration of the planned dormancy periods to ensure that the appropriate amount of funding is available to terminate the licenses for ZNPS. The rate of escalation assumed in decommissioning costs and the rate of earnings assumed on the tax qualified and the non-tax qualified decommissioning funds is periodically adjusted. A request for a needed change to the collection of decommissioning funds is made via a petition to the Illinois Commerce Commission for an adjustment to a special-purpose decommissioning expense rider (i.e., Rider 31). The status of the ZNPS decommissioning funding is reported periodically to the NRC in accordance with 10 CFR 50.75(f)(1), "Reporting and recordkeeping for decommissioning planning."

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report**TABLE V-1****Zion Nuclear Power Station**
Summary of Decommissioning Costs

Key Tasks / Milestone	Estimated Cost⁽¹⁾
Unit 1	
1998/1999 Decommissioning Costs ⁽²⁾	54,326
Staffing	49,467
Low-level Waste Burial	64,918
Equipment Removal	58,406
Low-level Waste Packaging and Shipping	9,121
Decontamination Activities	5,760
Other Costs ⁽³⁾	<u>75,724</u>
Subtotal	317,722
Unit 2 and Common	
1998/1999 Decommissioning Costs ⁽²⁾	54,327
Staffing	56,624
Low-level Waste Burial	91,360
Equipment Removal	90,250
Low-level Waste Packaging and Shipping	10,615
Decontamination Activities	9,185
Other Costs ⁽³⁾	<u>93,681</u>
Subtotal	406,042
Spent Fuel Management⁽⁴⁾⁽⁵⁾	180,499
Total \$904,261	

(1) Thousands of dollars, unadjusted 1996 dollars columns may not add due to rounding

(2) Actual decommissioning costs for both units, in current dollars, for 1998 and 1999 were \$59,169,300 and \$26,925,630, respectively

(3) Other costs such as insurance, property taxes, energy, NRC and State fees, etc

(4) The SFNt will be operational through 2025 until all spent fuel and GTCC waste is transferred to the DOE

(5) This excludes costs for non-storage related crane upgrades and spent fuel packaging/loading

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

VI. ENVIRONMENTAL IMPACTS

10 CFR 50.82(a)(4)(i) describes the PSDAR and requires that it include "a discussion that provides the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate previously issued environmental impact statements." The potential environmental impacts associated with the proposed decommissioning activities for ZNPS were compared with similar impacts given in the Final Environmental Statement (FES) for ZNPS (i.e., Reference 8), and in the Generic Environmental Impact Statements (GEISs) on decommissioning (i.e., Reference 9) and radiological criteria for license termination (i.e., Reference 10). The following discussion provides the that comparison.

The decommissioning of ZNPS will have the following generally positive environmental effects.

- Radiological sources that create the potential for radiation exposure to site workers and the public will be reduced.
- The site will be returned to a condition allowing unrestricted use
- The thermal impact on Lake Michigan from facility operations will be eliminated.
- Noise levels in the vicinity of ZNPS will be reduced.
- Hazardous materials and chemicals will be removed.
- Local traffic will be reduced (i.e., fewer employees, contractors, and materials shipments than are required to support an operating nuclear power plant).

The decommissioning of ZNPS will be accomplished with no significant adverse environmental impacts based on the following.

- No site-specific factors pertaining to ZNPS would alter the conclusions of the ZNPS FES or the GEISs.
- Radiation dose to the public will be minimal
- Radiation dose to decommissioning workers will be a fraction of the operating dose.
- The low-level radioactive waste removed from ZNPS will occupy a small portion of the burial volume at approved waste disposal sites.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

- The non-radiological environmental impacts are temporary and not significant.

The effects of decommissioning activities with respect to specific environmental issues are discussed below.

Radiation Dose to the Public

Radiation dose to the public will be maintained below levels comparable to when ZNPS was operating, through the continued application of radiation protection and contamination controls combined with the reduced source term available in the facility

Occupational Radiation Exposure

An estimated total of 637 person-rem will be incurred during the decommissioning of ZNPS. This total includes the exposure from decontamination and dismantlement activities and the exposure during transportation of the low-level radioactive wastes.

In the Reference 9 GEIS, a total dose of 664 person-rem is estimated for the 10 year SAFSTOR alternative for the single unit reference PWR plant. The decommissioning plan chosen for ZNPS closely resembles the SAFSTOR alternative described in the Reference 9 GEIS. The 637 person-rem estimated total dose for decommissioning ZNPS, a multiple unit site, is below the 664 person-rem total dose that was found acceptable for decommissioning the reference single unit PWR site in the Reference 9 GEIS. Therefore, the total occupational radiation dose estimated for the decommissioning of ZNPS is bounded by the previously issued Reference 9 GEIS.

Low-Level Radioactive Waste Burial Volume

The estimated low-level radioactive waste burial volume for the decommissioning of ZNPS is 338,900 cubic feet (i.e., 9,646 cubic meters). The Reference 9 GEIS estimates the volume as 18,340 cubic meters for the reference PWR using the 10 year SAFSTOR alternative. For waste requiring deep geological burial (i.e., GTCC waste), a total of 230 cubic feet (i.e., 6.5 cubic meters) of GTCC waste is estimated for each unit of ZNPS. This estimated value is less than the 11 cubic meters anticipated for the reference PWR in the Reference 9 GEIS. The estimates for ZNPS thus support the conclusion that the previously issued environmental statements are bounding, since the disposal of waste will require fewer resources, (i.e., less waste disposal facility area) than what was considered in the Reference 9 GEIS.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report**Non-Radiological Environmental Impacts**

The non-radiological environmental impacts from decommissioning ZNPS are temporary and not significant. The largest occupational risk associated with the decommissioning is the risk of industrial accidents. This risk will be minimized by adherence to work controls during decommissioning similar to the procedures followed during power operations. Procedures controlling work related to asbestos, lead, and other non-radiological hazards will also remain in place during decommissioning. The primary environmental effects of decommissioning are temporary, and include small increases in noise levels and dust in the immediate vicinity of the site, and small increases in truck traffic to and from the site for hauling equipment and debris. These effects will be similar to those experienced during normal refueling outages and certainly less severe than those present during the original plant construction. No significant socioeconomic impacts other than those associated with the decommissioning project (e.g., loss of jobs), or impacts to local culture, archaeological, terrestrial, or aquatic resources have been identified.

Additional Considerations

While not quantitative, the following considerations are also relevant to concluding that decommissioning activities will not result in significant environmental impacts not previously reviewed.

- The release of effluents will continue to be controlled by plant license requirements and plant operating procedures throughout decommissioning. With respect to radiological releases, ZNPS will continue to operate in accordance with the Offsite Dose Calculation Manual during decommissioning. Releases of non-radiological effluents will continue to be controlled in accordance with the requirements of the National Pollutant Discharge Elimination System (NPDES) and State of Illinois permits.
- Radiation protection principles used during plant operations will remain in effect during decommissioning to ensure that protective techniques, clothing, and breathing apparatus are used as appropriate.
- Sufficient decontamination prior to dismantlement will be performed to ensure that occupational dose and public exposure will not exceed those estimated in the GEISs.
- Transport of radioactive waste will be in accordance with plant procedures, applicable Federal and State regulations, and the requirements of the receiving facility.

Zion Nuclear Power StationPost-Shutdown Decommissioning Activities Report

- Site access control during decommissioning will ensure that residual contamination is minimized as a radiation release pathway to the public.

Conclusion

Based on the above discussion, the potential environmental impacts associated with decommissioning ZNPS have already been postulated in and will be bounded by the previously issued environmental impact statements, specifically the Reference 8 plant-specific FES and the Reference 9 and 10 GEISs. This is principally due to the following reasons.

- The postulated impacts associated with the decommissioning method chosen, SAFSTOR, have already been considered in the ZNPS FES and GEISs.
- There are no unique aspects of ZNPS or of the decommissioning techniques to be utilized that would invalidate the conclusions reached in the ZNPS FES and GEISs.
- The methods to be employed to dismantle and decontaminate ZNPS are standard construction-based techniques fully considered in the ZNPS FES and GEISs.

Therefore, it can be concluded that the environmental impacts associated with the site-specific decommissioning activities for ZNPS will be bounded by appropriate previously issued environmental impact statements

Zion Nuclear Power Station

Post-Shutdown Decommissioning Activities Report

VII. REFERENCES

1. ComEd letter, "Certification of Permanent Cessation of Operations," dated February 13, 1998
2. ComEd letter, "Certification of Permanent Fuel Removal," dated March 9, 1998
3. NRC letter, "Certification of Permanent Cessation of Power Operation and Permanent Removal of Fuel from the Reactor for Zion Nuclear Power Station, Units 1 and 2," dated May 4, 1998
4. Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," dated January 1999
5. NUREG-1575/EPA 402-R-97-016, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," dated December 1997
6. ComEd letter, "Submittal of the Zion Nuclear Power Station Site-Specific Decommissioning Cost Estimate," dated February 14, 2000
7. Atomic Industrial Forum, Inc./National Environmental Studies Project-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," dated May 1986
8. Atomic Energy Commission, "Final Environmental Statement Related to Operation of Zion Nuclear Power Station Units 1 and 2," dated December 1972
9. NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated August 1988
10. NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," dated July 1997